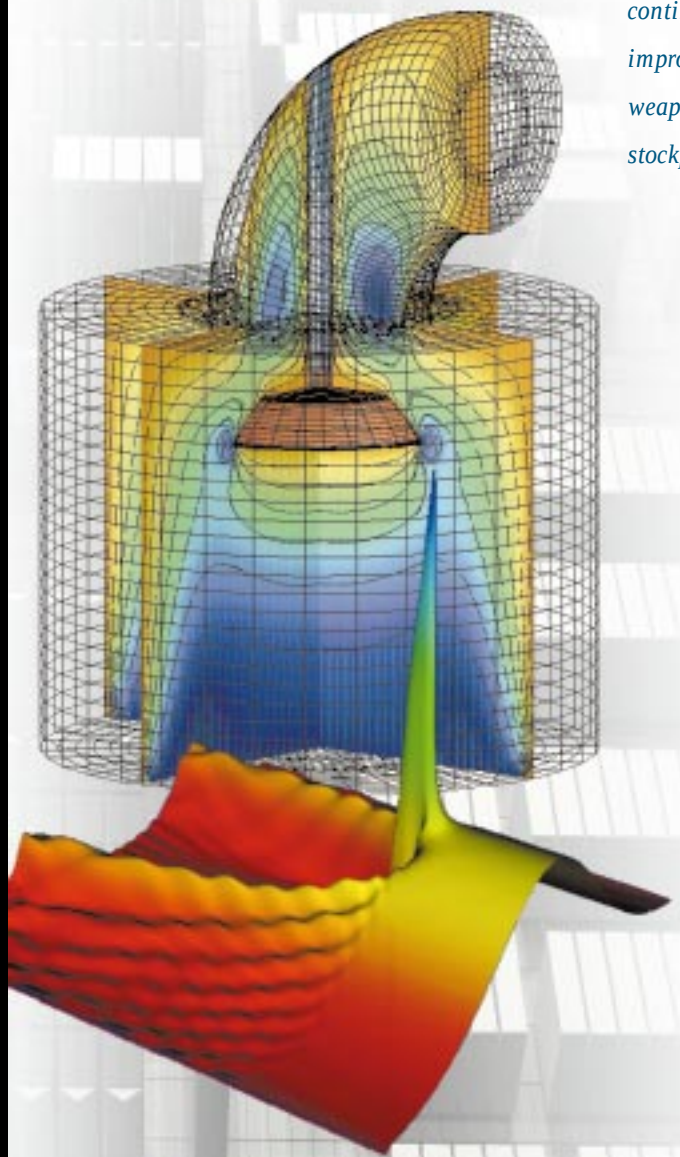
Stockpile Stewardship

Greater Capabilities to Come

The greatest challenges in stockpile stewardship lie ahead, as weapons continue to age. Program success depends on bringing into operation vastly improved scientific capabilities, which will be used by our experienced nuclear weapons designers to train and evaluate the skills of the next generation of stockpile stewards, who will rely on the new tools.



Through the Accelerated Strategic Computing Initiative, Livermore is acquiring successively more powerful computers for stockpile stewardship. For DOE sponsors, we develop applications that run efficiently on the machines' massively parallel architecture. Simulations are shown of the dynamics of complex systems (top) and the interactions of intense laser light with plasma (bottom).

Supercomputer Comes of Age

In a special ceremony on October 28, 1999, the Laboratory and IBM celebrated the "coming of age" of the Blue Pacific supercomputer with a special ceremony at Livermore. This machine, part of the Department of Energy's Accelerated Strategic Computing Initiative (ASCI), has been developed and delivered in several stages over the past three years. With all the critical elements now in place—software and code development, a functional problem-solving environment, interconnect and communications capabilities, and data storage facilities—Blue Pacific has become a mature tool for stockpile stewardship.

Created by IBM, Blue Pacific performs nearly 4 trillion operations per second, applying all of its 5,856 processors in parallel to a single computational problem. The supercomputer is 15,000 times faster than the average desktop personal computer. In addition, the machine has over 2.6 trillion bytes (2.6 terabytes) of memory—80,000 times more than the average desktop personal computer—and could store all of the books in the Library of Congress.

The October ceremony highlighted breakthrough research calculations performed on the new machine and included a preview of Option White. Currently being built by IBM as an extension of Blue Pacific, this machine will be able to perform 10 trillion operations per second and will have three times the capacity of Blue Pacific. Option White is planned for delivery in summer 2000. It is the next step in a strategy of acquiring successively much more powerful supercomputers through ASCI.

The advanced computing capabilities at Livermore created by ASCI also offer the potential of leading to unprecedented levels of understanding in climate and weather modeling, environmental studies, the design of new materials, and many areas of physics.

The 130-ton target chamber of the National Ignition Facility—which will house the world's most powerful laser—is shown being hoisted into place in the football-stadium-size building in June 1999.

Pushing the NIF Construction Forward

Construction is under way at Livermore on the National Ignition Facility (NIF), a cornerstone of DOE's Stockpile Stewardship Program. This stadium-size complex will house the world's most powerful laser. With NIF, many of the fundamental processes of thermonuclear detonation will, for the first time, become accessible to laboratory study and analyses.

By firing its laser beams in unison and focusing its energy on a BB-size target for a few billionths of a second, NIF will generate the temperatures and pressures needed to conduct experiments to validate weapons-physics computer codes and address important issues of stockpile stewardship. NIF also will provide a powerful new tool for basic research into the physics of stars, high-energy plasmas, and fusion energy.

Construction of the NIF building complex will be completed in 2001 as initially planned, and installation of the laser infrastructure will be under way. We have achieved extraordinary success in many technology areas—from new production processes to make the required 150 tons of laser glass to techniques for rapid growth of extremely large crystals used for frequency conversion. The underlying science and technology of the project are sound. However, the project will take longer and cost more than initially planned.

In September 1999, Secretary Richardson ordered a series of actions to address the schedule and cost issues that have arisen. At the same time, we made significant changes in the Laboratory's NIF management team. The Secretary's actions included the appointment of a task force of the Secretary of Energy Advisory Board to review NIF.

The NIF Laser System Task Force concluded in its Interim Report that ". . . with appropriate corrective actions, a strong management team, additional funds, an extension of schedule, and recognition that NIF is, at its core, a research and development project, the NIF laser can be completed." They added, "Several recent management changes as well as the new focus on systems engineering are encouraging."

We are committed to all actions necessary to ensure the success of NIF, which is an essential element of the Stockpile Stewardship Program. The new NIF project management team is developing a revised NIF project plan, and the project is proceeding.